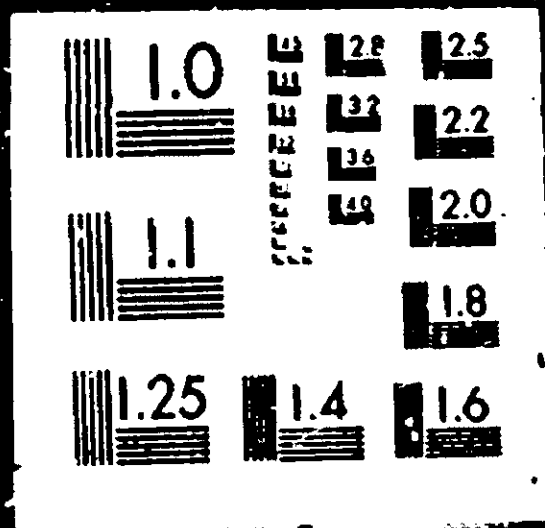


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Safety Report: Progress Toward Improvements in Marine Steering Reliability

(U.S.) National Transportation Safety Board, Washington, DC

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NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

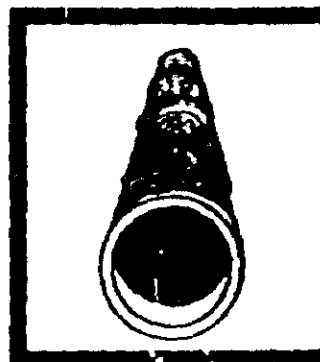
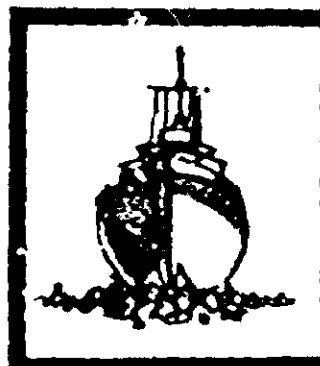
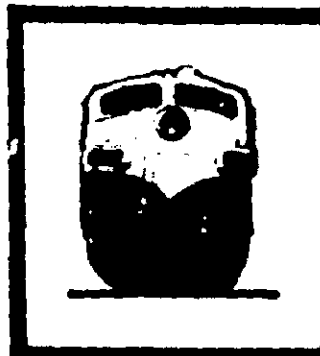
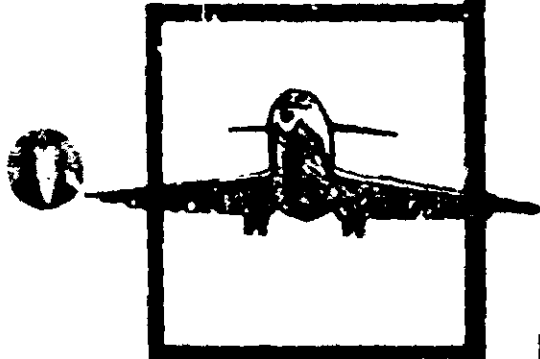
SAFETY REPORT

**PROGRESS TOWARD IMPROVEMENTS IN
MARINE STEERING RELIABILITY**

NTSB-SR-79-1

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16. Abstract <p>The reliable operation of vessel steering systems is vital to the prevention of accidents in congested and restricted ports and waterways. Increases in the number and size of ships, particularly those transporting hazardous materials such as crude oil, liquefied petroleum gas and liquefied natural gas, have increased the potential for disastrous consequences when accidents occur.</p> <p>Since mid-1973, the Safety Board has analyzed three accidents caused by steering failure, identified critical safety problems, and issued a total of 17 recommendations to the U.S. Coast Guard urging adoption of improved steering system safety standards.</p> <p>In response to Safety Board recommendations, the Coast Guard has proposed new or improved safety regulations applicable to U.S. vessels, and in some cases, to both U.S. and foreign vessels. However, the Coast Guard has not implemented safety improvements as rapidly as possible and has been reluctant to apply standards unilaterally to foreign vessels which call at U.S. ports in the absence of international acceptance of the standards. The effect is a double standard of safety for U.S. and foreign vessels.</p>			
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FOREWORD

The mission of the National Transportation Safety Board is to improve transportation safety. This is done by determining the probable cause of accidents through direct investigations and public hearings, and through staff review and analysis of accident information, through evaluations of operations, effectiveness, and performance of other agencies, through special studies and safety investigations, and through published recommendations and reports.

Since its establishment, the Safety Board has been concerned that solutions to certain safety problems of national significance have not been implemented as rapidly as possible, even though the solutions were known, feasible, and timely. Therefore, the Safety Board has begun to identify such problems each year and aggressively pursue implementation of specific safety improvements. One of these safety objectives during fiscal year 1979 was to obtain the establishment by the U.S. Coast Guard of more stringent safety requirements to insure marine steering reliability and a commitment to implement needed safety improvements identified in Safety Board recommendations.

This Safety Report outlines Safety Board efforts to stimulate implementation of safety improvements, describes progress made toward improved steering reliability, and identifies remaining problems.

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

**SAFETY REPORT ON PROGRESS TOWARD IMPROVEMENTS
IN MARINE STEERING RELIABILITY**

Adopted: September 21, 1979

BACKGROUND

Daily, hundreds of large vessels safely navigate congested and restricted U.S. ports and waterways, carrying a variety of cargoes which are essential to the National economy. However, when accidents occur in these waters, they can result in serious consequences which may affect not only the vessels and their crews, but also surrounding populations and the marine environment as well. Of paramount importance to the safe navigation of vessels in congested and restricted ports and waterways is the reliability of vessel steering systems. The increasing number and size of vessels transporting crude oil, gasoline, liquefied natural gas, liquefied petroleum gas, and other hazardous materials makes the reliable operation of vessel steering systems vital to the prevention of potentially disastrous accidents.

From 1954 to 1977 the amount of oil transported by sea increased by 700 percent--from 250 million tons to more than 1,700 million tons. During the same period, the world's fleet of tankers increased from about 3,500 ships totalling 37 million deadweight tons to nearly 7,000 ships totalling 340 million deadweight tons. 1/ These increases mean that more and larger vessels are calling at U.S. ports than ever before.

The U.S. Coast Guard is responsible for regulating the safety of vessels entering U.S. ports and waterways and for the protection of the marine environment. However, accident experience indicates that current Coast Guard regulatory standards for steering reliability do not adequately provide for the safe navigation of vessels in congested and restricted waters.

Accidents involving steering system failure are not uncommon. Coast Guard accident reports on large tank vessels alone indicate that between 1963 and 1976 87 accidents involved steering system failure on U.S. tank vessels and on foreign tank vessels in U.S. waters. 2/ (This figure includes only those accidents which involved tank vessels of 20,000 or more deadweight tons.) Many other steering failures probably have occurred, but because regulations did not specifically require the formal reporting of steering malfunctions unless they resulted in accidents, the full extent of the steering reliability problem is unknown.

1/ Inter-Governmental Maritime Consultative Organization, "The International Conference on Tanker Safety and Pollution Prevention 1978."

2/ U.S. Coast Guard Notice of Proposed Rulemaking, "Improved Emergency Steering Standards for Oil Tankers," CGD No. 77-063, 42 F.R. 24869-370, May 16, 1977.

SAFETY BOARD ACTIONS TO STIMULATE SOLUTIONS

Since mid-1973, the Safety Board has analyzed three accidents which resulted from steering system failures and identified safety problems and the corrective actions required to reduce the risk of recurrence of these types of accidents.

SS C.V. SEAWITCH/SS ESSO BRUSSELS Collision and Fire

The first of these accidents occurred on June 2, 1973, when the SS C.V. SEAWITCH collided with the Belgian tankship SS ESSO BRUSSELS at anchor in New York Harbor. The accident occurred because the SEAWITCH lost steering control, veered out of the harbor channel, and struck the ESSO BRUSSELS, which was loaded with crude oil. In the collision and the resulting fire which engulfed both vessels, 16 persons died, damage to property totaled \$23 million, and surrounding beaches were polluted. 3/

The Safety Board determined that the probable cause of the accident was a mechanical failure of the steering system of the SEAWITCH and the lack of adequate and timely action by the crew to control the ship after the failure. The cause of the loss of steering was a deficiency in the design of the system, so that it did not provide "two separate and independent steering control systems" as required by Federal regulations, although the Coast Guard had approved the SEAWITCH steering gear installation as complying with the requirement.

The Safety Board also observed that the emergency steering station in the steering gear room on the SEAWITCH provided the means to disconnect immediately all control circuits from the bridge and to steer directly in response to orders relayed from the bridge. However, this station was normally not manned in harbors and there was no emergency signal and procedure for manning it.

Based on its analysis of the SS C.V. SEAWITCH/SS ESSO BRUSSELS collision, the Safety Board recommended that the Coast Guard establish requirements for:

- Separate and independent steering controls.
- Manning the emergency steering station while in designated restricted waters.
- The reporting of all steering failures in U.S. waters on U.S. and foreign oceangoing vessels.
- Written emergency procedures and alarms for loss of steering control for all U.S. oceangoing vessels.
- Emergency power for steering on all future U.S. vessels.

3/ Department of Transportation, Coast Guard Marine Casualty Report with Action by the National Transportation Safety Board, "SS C.V. SEAWITCH - SS ESSO BRUSSELS (Belgium): Collision and Fire in New York Harbor on 2 June 1973 with Loss of Life," Report No. USCG/NTSB-MAR-75-6, March 2, 1976.

SS MARINE FLORIDIAN Ramming of the
Benjamin Harrison Memorial Bridge

The ramming of the Benjamin Harrison Memorial Bridge near Hopewell, Virginia, by the U.S. tankship SS MARINE FLORIDIAN on February 24, 1977, was the subject of a joint investigation by the Safety Board and the Coast Guard. The ship rammed the bridge after the vessel's steering system malfunctioned at a point about 500 yards from the bridge. The tankship veered out of the channel and struck a bridge tower span. The bridgetender was injured slightly, and damage to the bridge and the vessel was estimated at \$8.5 million. 4/

The Safety Board determined that the probable cause of the accident was inadequate maintenance and inspection of a manual switch in an electrical circuit, which opened by the force of gravity, interrupting power to the steering motor. Contributing to the cause of the collision was the operation of the vessel at a speed higher than necessary for safe passage of the bridge opening, failure of the steering alarm to function, and the absence of a person on watch in the steering engine room, which contributed to the delay in activating the alternate steering engine.

As a result of its analysis of the ramming of the Benjamin Harrison Memorial Bridge by the SS MARINE FLORIDIAN, the Safety Board recommended that the Coast Guard amend its regulations to:

- Require installation of an audible alarm in the wheelhouse to indicate power interruption to steering gear motors, in addition to alarms currently required.
- Require motor protective devices and interlocks to increase the reliability of electric-powered steering gears.
- Require additional steering tests.
- Require upgrading of steering systems whenever a ship is modernized, rebuilt, or otherwise substantially altered.
- Require that persons assigned to manning emergency steering locations are competent and trained, and will be in communication with the wheelhouse.

SS SITALA Collision With Moored Vessels

The third accident analyzed was the July 28, 1977, collision of the French tankship SS SITALA with a moored fleet of marine construction vessels near New Orleans, Louisiana. The accident resulted in \$1.5 million in damage to the SITALA, other vessels, and equipment. 5/

4/ National Transportation Safety Board Marine Accident Report, "U.S. Tankship SS MARINE FLORIDIAN Collision with Benjamin Harrison Memorial Bridge, Hopewell, Virginia, February 24, 1977," Report No. NTSB-MAR-78-1, January 26, 1978.

5/ National Transportation Safety Board Marine Accident Report, "French Tankship SS SITALA Collision with Moored Vessels, New Orleans, Louisiana, July 28, 1977," Report No. NTSB-MAR-78-10, December 21, 1978.

The Safety Board determined that the probable cause of the accident was the failure of the steering gear, which resulted from inadequate maintenance and inspection by the ship's crew. Contributing to the cause of the accident were the inadequate inspection of the steering gear by a classification society surveyor ^{6/} and the design of the steering gear, which utilized a single control path to the steering gear power units.

In one of its findings, the Safety Board concluded that the provision of two independent and separate steering systems would have allowed the SITALA's crew to rapidly regain steering control and could have prevented the accident.

As a result of its analysis of the SS SITALA collision with moored vessels, the Safety Board recommended that the Coast Guard:

- Amend proposed steering standards for tankships entering U.S. waters to reduce the time delay to actuate alarms to alert the crew to steering failures.
- Amend regulations to insure that all vessels are equipped with adequate test devices to indicate that steering gear is operating properly.
- Initiate action through the Inter-Governmental Maritime Consultative Organization to develop a program emphasizing the importance of a vessel's steering gear reliability.
- Expand the current foreign vessel boarding program to include steering gear inspections.

Currently, the Safety Board is jointly investigating with the Coast Guard an accident in which loss of steering was allegedly involved. The accident occurred on the lower Mississippi River near Good Hope, Louisiana, on August 30, 1979. The Peruvian cargo vessel M/V INCA CAPAC YUPANQUI struck the U.S. tank barge PANAMA CITY, which was loading butane, and the PANAMA CITY erupted into a massive fireball. The tank barge was cut in half and one half floated downriver, billowing flames, which forced the evacuation of residential subdivisions 3 miles down the river. Initial reports indicate that 10 persons died and 11 were injured. Upon conclusion of the investigation, the Safety Board will make its determination of probable cause and publish its findings.

COAST GUARD RESPONSIVENESS

As a result of its analyses of accidents involving steering system failures, the Safety Board has identified serious steering reliability deficiencies, disseminated its findings in published accident reports, and issued 17 recommendations ^{7/} for implementation of needed safety improvements to the Coast Guard. The Coast

^{6/} Classification societies are private organizations which survey vessels and determine their seaworthiness for insurance purposes.

^{7/} See Appendix I for a chronology of major events in the improvement of marine steering reliability; see Appendix II for complete list of Safety Board recommendations for improved marine steering reliability.

Guard has initiated several rulemaking actions and has indicated its intention to promulgate additional safety requirements in the near future which respond to Safety Board recommendations for improved standards for marine steering reliability. Final rulemaking action has not yet been completed.

On May 16, 1977, the Coast Guard published in the Federal Register proposed "Emergency Steering Standards for Oil Tankers." ^{8/} The proposed safety requirements were also presented to the Inter-Governmental Maritime Consultative Organization, the body which develops international maritime safety and technical standards, at the Tanker Safety and Pollution Prevention (TSPP) Conference, February 6 to 17, 1978, for consideration as international standards. The TSPP Conference accepted some of the proposed safety requirements, but rejected others. On February 12, 1979, the Coast Guard republished its proposed requirements regarding emergency steering for oil tankers with a new title -- "Federal Safety Standards for Improved Steering Gear on Tank Vessels of 10,000 Gross Tons or More." Some safety requirements which had been recommended by the Safety Board and which had appeared in the original NPRM, were deleted from the revised NPRM. The Coast Guard cited lack of support by the TSPP Conference as the reason for the deletions.

On June 27, 1977, the Coast Guard published proposed "Electrical Engineering Regulations," which included requirements for redundant steering control systems. ^{9/} Based upon evaluation of comments submitted in response to the NPRM, the Coast Guard has indicated that it will revise the proposals and republish them.

On October 19, 1978, the Coast Guard published an NPRM entitled "Casualty Reporting Requirements" which would require formal marine casualty reporting of steering gear failures. ^{10/} The Coast Guard expected to publish the final rule in April 1979, but later indicated that the proposed requirements are undergoing revision and will be republished in a new NPRM.

Currently, 16 of the 17 Safety Board recommendations for improvement of marine steering reliability remain open. Based upon evaluation of Coast Guard responsiveness, eight recommendations are classified as "open, acceptable action," and eight are classified as "open, unacceptable action." The status of the remaining recommendation is "closed - unacceptable action."

The Safety Board believes that final rulemaking action by the Coast Guard on the electrical engineering regulations for all U.S. vessels and improved emergency steering gear for tank vessels 10,000 gross tons or more (U.S. and foreign) may substantially satisfy the intent of several of the Safety Board's recommendations. The recommendations that may be satisfied (M-76-1, M-76-4, M-76-5) are primarily the need for redundant and completely independent steering systems (U.S. and foreign vessels); emergency procedures and alarms for loss of steering control (U.S. vessels); and emergency power for steering (new U.S. vessels).

^{8/} Notice of Proposed Rule Making (NPRM), Coast Guard Docket No. 77-063, 42 F.R. 24869.

^{9/} NPRM, Coast Guard Docket No. 74-125, 42 F.R. 32700.

^{10/} NPRM, Coast Guard Docket No. 76-170, 43 F.R. 48982.

Additionally, the Coast Guard is taking further rulemaking action (CGD 76-170) in response to Recommendation No. M-76-3, which proposes adoption of a requirement that all steering failures on U.S. vessels and on foreign vessels in U.S. waters be reported to the Coast Guard.

There are several major safety recommendations on which the Safety Board and the Coast Guard have not yet reached satisfactory understanding. The specific recommendations are classified as "open-unacceptable action." Two of the recommendations (M-76-2 and M-77-12) propose requirements for manning of steering gear spaces in designated and restricted U.S. waters. The Coast Guard indicated in a meeting with Safety Board representatives on August 24, 1979, that manning does not need to be addressed since the Coast Guard will require redundant and completely independent steering systems. The Coast Guard did propose manning of steering gear spaces at the TSPP Conference; however, the conference delegates believed that a mandatory requirement would be difficult to enforce internationally, and the proposal was rejected.

The Safety Board recommended adoption of a requirement for specific steering gear tests in Recommendation No. M-77-10. In comments submitted in response to the proposed regulations for U.S. and foreign tank vessels, the Safety Board indicated that these requirements should be made applicable to all oceangoing vessels of 1,600 or more gross tons. Currently, the rulemaking proposal covers only tankships of 10,000 or more gross tons. Therefore, the Coast Guard response to M-77-10 is "open-unacceptable action." It should be noted that the Coast Guard at the August 24, 1979, meeting with Safety Board representatives indicated that a forthcoming revision of the proposed electrical engineering regulations would address all U.S. oceangoing vessels and could be more responsive to this recommendation.

In Recommendation No. M-77-11 the Safety Board urged the amendment of Coast Guard regulations to require upgrading of vital vessel control systems to meet current standards whenever a U.S. oceangoing vessel is modernized, lengthened, rebuilt, or converted to another service. The Safety Board believes that all systems for ship control should be listed in the Navigation and Vessel Inspection Circular (NVIC) 12-65 (dated September 1, 1965) entitled "Alteration or Modification of Existing Cargo or Tank Vessels: Associated Safety Improvements," and that the upgrading of these controls should be regulated. The Coast Guard response stated that action on Safety Recommendations Nos. M-77-8 and M-77-9 would bring steering systems to current standards and that additions to the systems listed in NVIC 12-65 were not considered necessary. Both Safety Recommendations M-77-8 and M-77-9 will not be adequately addressed until final rulemaking on the proposed electrical engineering regulations is completed.

The Coast Guard recently responded on August 17, 1979, to the Safety Recommendations adopted as a result of the SS SITALA collision. In response to the Safety Board's recommendation that all vessels be equipped with steering gear test devices (Recommendation No. M-78-81), the Coast Guard responded that such requirements should not be proposed at this time. The Coast Guard's position is that operation of the steering gear from the bridge and from the steering gear

compartment when the vessel is operating is a better check. However, during the investigation of the SITALA accident, it was documented that a classification society surveyor had inspected the ship 2 days before the steering failure and certified that the steering machinery was satisfactory. There was evidence of a steering gear malfunction 9 minutes before the steering failure, which the crew did not detect. After the collision the steering gear was inspected and operated but no further malfunction occurred. The Coast Guard permitted the vessel to proceed under tug escort and about 5 hours later the ship lost steering again. The Safety Board believes that Coast Guard reliance on "operational tests" to determine the condition of steering gear equipment is insufficient. Therefore, the status of this recommendation is "open - unacceptable action."

Additionally, the Safety Board adopted Recommendation No. M-78-83, because the cast-iron differential foundation (a component integral to the steering gear) failed under tests because of material defects. The Safety Board believes that such a defect could cause total steering system failure without warning and lead to a serious accident. The Coast Guard in its response did not agree that testing of all differential controller foundations on vessels having steering gear similar to that of the SS SITALA was warranted. The Safety Board believes that the Coast Guard is adamant in its position; therefore, the status of this recommendation is "closed - unacceptable action."

The Safety Board also recommended that the Coast Guard expand its foreign vessel boarding program with respect to steering gear inspections to determine the adequacy of current maintenance practices and report its findings (M-78-84). The Safety Board's intent is that the Coast Guard determine if inadequate maintenance such as that found on the SS SITALA is prevalent on foreign vessels. Even though the Coast Guard does not have direct control over foreign vessel safety programs, we believe such examination falls within the Coast Guard's authority for insuring safety in U.S. ports and waterways. If the Coast Guard can determine that general maintenance practices on foreign vessels do not result in increased accident risks, the intent of this recommendation will be satisfied. However, the SITALA accident clearly indicates that the classification society surveys may not be adequate without stricter prescriptions for maintenance checks.

SUMMARY OF PROGRESS AND REMAINING PROBLEMS

The Coast Guard has initiated several rulemaking actions to establish or improve Federal standards for marine steering reliability; has indicated its intention to initiate certain additional rulemaking actions; and has proposed the adoption of improved international standards through the Inter-Governmental Maritime Consultative Organization.

The Safety Board considers these actions responsive to some of its recommendations for improvement of marine steering reliability. When fully implemented, the standards proposed by the Coast Guard will increase the level of safety in U.S. ports and waterways. However, the Coast Guard has not acted to implement proposed standards as rapidly as possible and the initiation of the proposals themselves has been slow. In addition, it is apparent that the Coast Guard has been reluctant to unilaterally adopt needed safety requirements for

foreign vessels which call at U.S. ports in the absence of international acceptance of the standards through Inter-Governmental Maritime Consultative Organization.

U.S. standards directed to prevention of steering failure accidents or to enhancing vessels' accident avoidance capability have generally been applied to both U.S. and foreign vessels only when the standards are acceptable to other nations; when international support cannot be obtained, standards sometimes have been made applicable to U.S. vessels only or the proposals have been withdrawn entirely. The effect is a double standard of safety for U.S. and foreign vessels or totally foregoing higher safety standards. This result is not in consonance with the Ports and Waterways Safety Act of 1972, as amended, which states that if safety standards cannot be adopted at the international level in a reasonable time frame, then U.S. regulations should be issued applicable to both foreign and U.S. tank vessels.

Additionally, vessels other than tankships are subject to steering failure accidents. Therefore, the Safety Board believes that one set of clearly defined standards for all oceangoing vessels (U.S. vessels and foreign vessels calling at U.S. ports) should be judiciously applied.

With respect to the Coast Guard's rulemaking activities, the Safety Board believes improved steering reliability should be a major safety priority, and, therefore, the Coast Guard should complete final rulemaking actions as expeditiously as possible. Further delays in rulemaking action can only prolong the dangers from steering gear failure in the congested and restricted ports and waterways of the United States.

In addition to satisfactory completion of final rulemaking on the regulatory actions affecting improved marine steering reliability, the Safety Board believes the following safety requirements must be implemented unilaterally by the Coast Guard for all vessels entering U.S. ports and waterways:

- (1) A wheelhouse alarm for loss of steering control.
- (2) A requirement for duplication of differential unit or hunting gear in all new oceangoing vessels, including foreign vessels entering U.S. waters.
- (3) A requirement for the performance of specific steering gear tests for all oceangoing vessels entering U.S. ports and waterways, including activation of alarm systems by simulation of power interruption to each of the steering motors.
- (4) A requirement for steering gear test devices on all vessels that will indicate whether the steering gear is operating properly.
- (5) A requirement for manning of steering gear spaces in designated restricted waters for U.S. and foreign vessels.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

September 21, 1979

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APPENDIXES

APPENDIX I

CHRONOLOGY OF MAJOR EVENTS TOWARD IMPROVING MARINE STEERING RELIABILITY

- June 2, 1973 - The SS C.V. SEAWITCH lost steering control and collided with the SS ESSO BRUSSELS in New York harbor. The accident resulted in 16 fatalities and about \$23 million in property damage.
- June 28, 1974 -- The Coast Guard published an Advanced Notice of Proposed Rulemaking (ANPRM) CGD 74-77 which included proposals to require manning of the primary steering gear controlroom when in congested waters.
- March 2, 1976 - The Safety Board adopted recommendations M-76-1 through M-76-5 in Report No. USCG/NTSB-MAR-75-6, "SS C.V. SEAWITCH—SS ESSO BRUSSELS (Belgium); Collision and Fire in New York Harbor on 2 June 1973 with Loss of Life."
- May 6, 1976 - The Coast Guard published a Notice of Proposed Rulemaking (NPRM) CGD 74-77 which substantively met the Safety Board's recommendation that manning of the primary steering gear controlroom be required when in congested waters.
- January 31, 1977 - The Coast Guard published a final rule CGD 74-77 which did not meet the Safety Board's recommendation that manning of the primary steering gear controlroom be required when in congested waters.
- February 24, 1977 - The SS MARINE FLORIDIAN rammed the Benjamin Harrison Memorial Bridge near Hopewell, Virginia, because of a steering system failure. Total damage to the bridge and vessel was \$8.5 million.
- March 17, 1977 - As a result of a number of serious tankship accidents President Carter proposed tanker safety and pollution prevention initiatives which included proposals for improved emergency steering standards for all tankers entering U.S. ports. This action strengthened the U.S. position in international negotiations and reiterated the national commitment to international solutions if possible.
- March 21 and 23, 1977 - Hearings were held before a subcommittee of the Committee on Government Operations, 95th Congress, 1st session on "Coast Guard Efforts to Prevent Oil Pollution Caused by Tanker Accidents."
- May 16, 1977 - The Coast Guard published proposed regulations for tanker safety, NPRM CGD 77-063 including proposals for improved steering reliability which conceptually agreed with Safety Board recommendations.

—June 27, 1977 — The Coast Guard published proposed changes to its electrical engineering regulations in NPRM CGD 74-125, which conceptually agreed with Safety Board recommendations.

—July 28, 1977 — The French tankship SS SITALA collided with moored vessels near New Orleans, Louisiana, because of steering failure. Total damage to the SITALA and other vessels and equipment totaled \$1.5 million.

—August 4, 1977 — The Safety Board commented on CGD 74-125, "Electrical Engineering Regulations," supporting the Coast Guard with the reservation that the requirements should be applied to all oceangoing vessels of 1,600 or more gross tons.

—August 4, 1977 — Safety Board recommendations M-77-8 through M-77-14 relating to steering systems performance and reliability were adopted as a result of the SS MARINE FLORIDIAN accident.

—August 22, 1977 — The Safety Board supported Coast Guard rulemaking action NPRM CGD 77-083, but called attention to several technical deficiencies. The Safety Board reiterated the need for improved steering reliability on all oceangoing vessels of 1,600 or more gross tons.

—October 19, 1977 — A report entitled "Coast Guard Efforts to Prevent Oil Pollution by Tanker Accidents" was published by U.S. House of Representatives. A major recommendation stated: "The Congress should continue to actively monitor the Coast Guard to insure that the March 17, 1977, Presidential proposal concerning ship construction and equipment standards is implemented, and that the Coast Guard does not continue to require prior acceptance by the Inter-Governmental Maritime Consultative Organization (IMCO) in future related rulemaking."

—January 26, 1978 — The Safety Board issued Report No. NTSB-MAR-78-1, "U.S. Tankship SS MARINE FLORIDIAN Collision with Benjamin Harrison Memorial Bridge" with recommendations M-77-8 through M-77-14.

—February 6 - 17, 1978 — The IMCO held an International Tanker Safety and Pollution Prevention (TSPP) Conference in London. During the TSPP Conference a resolution was adopted requiring two or more steering power units arranged so that they could be placed in operation either automatically or remotely from the navigation bridge. The resolution also required that the power units be arranged to start automatically when there was a power failure, and that a single failure in the power units or their piping must not jeopardize the integrity of the entire system.

—March 16, 1978 — The Liberian very large crude carrier (VLCC) tankship AMOCO CADIZ grounded off the coast of France following a steering system failure. The steering system involved was considered to meet or exceed all existing and most of the proposed internationally accepted criteria considered necessary to insure a safe, reliable vessel steering system.

—April 20, 1978 — The Coast Guard published a Tanker Safety and Pollution Prevention Information and Regulatory Information Plan. The plan indicated that rulemaking action would be initiated to implement those tank vessel steering safety requirements which had been accepted in IMCO resolutions.

—May 26, 1978 — The Safety Board participated in the Republic of Liberia accident inquiry as an interested party in the AMOCO CADIZ accident.

—June 1, 1978 — The Coast Guard's rulemaking plan was published in the Federal Register by the Department of Transportation. Two regulatory proposals were pertinent as follows:

- (a) Revision of Electrical Engineering Regulations (NPRM CGD 74-125). This NPRM updates electrical engineering regulations for new steering installations. A supplemental NPRM was to be published by September 1978. Subsequently, the NPRM was rescheduled for issuance in March 1979; however, as of August 1978 the NPRM had not been reissued.
- (b) Steering Gear Design Standards to Provide Redundancy (NPRM CGD 77-063). The Coast Guard announced that an NPRM to implement IMCO resolutions on steering reliability was to be issued September 1978. This NPRM was not published until February 12, 1979.

—September 1978 — The Coast Guard presented the U.S. position on marine steering reliability at an IMCO meeting in London, England.

—October 19, 1978 — The Coast Guard published proposed regulations for improvement in steering gear failure reporting for U.S. vessels and foreign vessels which call at U.S. ports in NPRM CGD 76-170.

—December 21, 1978 — The Safety Board issued Report No. NTSB-MAR-78-10, "French Tankership SS SITALA Collision with Moored Vessels, New Orleans, Louisiana, July 28, 1977." Safety Board Recommendations Nos. M-78-79 through M-78-85 were adopted, five of which were related to steering system performance and inspection.

—December 22, 1978 — The Safety Board, in a letter to the Commandant, U.S. Coast Guard, identified vessel steering systems reliability as an area of major transportation safety concern. Safety recommendations as a result of the SS MARINE FLORIDIAN were again reiterated and Coast Guard responses were requested.

—February 12, 1979 — The Coast Guard published NPRM CGD-77-063, "Federal Safety Standards for Improved Steering Gear on Tank Vessels of 10,000 Gross Tons or More." The previous rulemaking action of May 16, 1977, was withdrawn.

—February 23, 1979 — The Republic of Liberia published an interim report, "In the Matter of the Loss by Grounding of the VLCC AMOCO CADIZ, O.S.-4773," and concluded that "a single failure of a major pipe joint or casing on

the type of steering gear normally accepted on a majority of V.L.C.C.'s can quickly result in the loss of most of the hydraulic fluid and lead to uncontrollable movements of the rudder before corrective action can be taken." In conclusion, the report states, "In many cases an adequate built-in factor of safety has to some extent compensated for the reliance on a single system as opposed to reliance on redundancy. In this case, the factor of safety did not justify the reliance on a single system."

—April 9, 1979 — The Safety Board submitted comments to the Coast Guard supporting the intent of the NPRM CGD-77-063, but identified several areas of concern as follows:

- (a) The regulations promulgated under the Ports and Waterways Safety Act of 1972, as amended, should apply uniformly to U.S. and foreign tank vessels even if international standards are not adopted.
- (b) Steering regulations should apply to all oceangoing vessels of 1,600 or more gross tons which call at U.S. ports.
- (c) Two or more independent steering gears should be required, including but not limited to the power units. This requirement should apply to foreign and U.S. tank vessels.
- (d) An alarm device should be required for any major system failure, not only for loss of electrical power to the steering system.
- (e) The regulations proposed a standard of 45 seconds to restore steering power in the case of a failure; however, a judicious effort must be made to minimize time delays as recovery of steering capability relies on rudder response and human factor performance.

—August 24, 1979 — U.S. Coast Guard and Safety Board representatives held a recommendation followup meeting in which the status of steering reliability recommendations was discussed.

—August 30, 1979 — The Peruvian vessel M/V INCA CAPAC YUPANQUI collided with the U.S. tank barge PANAMA CITY. Initial reports indicated 10 dead and 11 injured in the accident, as well as extensive property damage.

APPENDIX II

STATUS OF SAFETY BOARD
RECOMMENDATIONS TO THE COAST GUARD
ON MARINE STEERING RELIABILITY

- M-76-1 Revise its interpretation of 46 CFR 58.25-55, which requires separate and independent steering controls, to prevent the use of a single control path up to the steering power units as was done on the SEAWITCH. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-76-2 Establish a requirement for oceangoing vessels in designated restricted waters such as New York harbor to have the emergency steering station manned. This also should apply to foreign vessels. (Class II, Priority Followup.) Status: Open - Unacceptable Action
- M-76-3 Require all steering failures aboard U.S. oceangoing vessels to be reported to the Coast Guard. Such failures aboard foreign vessels also should be reported if the failure occurs in U.S. waters. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-76-4 Require that the emergency generator on future U.S. vessels provide power to the steering gear upon loss of a ship's normal electric power. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-76-5 Require all U.S. oceangoing vessels to establish written emergency procedures and alarms for loss of steering control. Emergency drills for loss of steering control should be required and logged. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-77-8 Amend 46 CFR 111.80-70 (f)(1) and (2) to require the installation of a pilot light and an audible alarm to indicate power interruption to steering gear motors in the wheelhouse, independent of and in addition to those currently required to so indicate at the propulsion control station. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-77-9 Amend 46 CFR 111.01 and 111.90 to make the provisions of 46 CFR 111.80-70(c) (2) and 111.80-70 (e) applicable to vessels equipped with electric-powered steering gear and contracted for prior to November 19, 1952, which would require the removal of motor-running protective devices; the installation of protective devices responsive to motor current, temperature, or both; and the installation of interlocks to prevent both steering systems from being connected to the same feeder circuit simultaneously. (Class II, Priority Followup.) Status: Open - Acceptable Action
- M-77-10 Amend 46 CFR 35.20-10, 78.17-15, and 97.15-3 and 33 CFR 164.25 to require additional specific steering gear tests including the switching from one steering gear control system to the other, from hydraulic

control to electric control and back; from one source of electrical power for the steering motors to the other and back; and the activation of alarm systems by simulation of power interruption to each of the steering motors. (Class II, Priority Followup.) Status: Open - Unacceptable Action

M-77-11 Amend regulations to require the upgrading to meet current standards of all systems vital not only to onboard safety but also to vessel control whenever an oceangoing vessel is modernized, lengthened, rebuilt or converted to another service. (Class II, Priority Followup.) Status: Open - Unacceptable Action

M-77-12 Undertake further rulemaking to amend 33 CFR 164.15 to require, when steering gear rooms are required to be manned, that the persons assigned are competent and trained to switch the steering gear to all alternate modes and control systems, and to require that the person manning the steering engine room is in communication with the wheelhouse. (Class II, Priority Followup.) Status: Open - Unacceptable Action

M-77-13 Make a special one-time inspection of manual transfer switch installations, such as that found in the MARINE FLORIDIAN, on a representative number of vessels and based on the findings, change steering gear inspection procedures to assure that mechanical faults in the electrical system are identified and corrected during future periodic inspections (Class II, Priority Followup.) Status: Open - Acceptable Action

M-77-14 Determine, in vessels which have electric and hydraulic components installed so that both steering motors can be operated simultaneously, whether such operations would provide a safe and viable dual capacity without risk of causing a failure to some component of the steering gear. If such operation is found to be safe, require the operation of both motors by vessels so equipped while they are underway in restricted or congested waters to insure that steering is not lost even though one motor fails to function. (Class II, Priority Followup.) Status: Open - Acceptable Action

M-78-79 Amend the proposed steering standards for tankships to reduce the time allowed for alarms to alert the crew of a failure and to reduce the time allowed to restore steering control, and make these requirements applicable to all seagoing vessels entering U.S. navigable waters. (Class II, Priority Action) Status: Open - Unacceptable Action

M-78-80 Initiate action through the Inter-Governmental Maritime Consultative Organization to develop a program to insure that owners, operators, crewmen, and inspectors are made aware of the importance of a vessel's steering gear and the importance of proper maintenance of this equipment. (Class II, Priority Action) Status: Open - Unacceptable Action

- M-78-81 Amend 46 CFR 58.25 and 33 CFR 164 to require that all vessels be equipped with test devices which will indicate whether the steering gear is operating properly and to require that operating parameters, test procedures, and maintenance records be made available to crewmembers and inspectors during the inspections and tests, including those required by 46 CFR 35.20-10, 78.17-15, and 97.15-3, and by 33 CFR 164.25, so that proper evaluations can be made regarding the machinery's operation. (Class II, Priority Action) Status: Open - Unacceptable Action
- M-78-83 Determine which vessels entering U.S. waters are fitted with the same type steering gear installed on the SITALA. Require testing of the installed cast-iron differential controller foundation to determine if defects similar to those detected on the SITALA are present, and report the findings. (Class II, Priority Action) Status: Closed - Unacceptable Action
- M-78-84 Expand the foreign vessel boarding program with respect to the steering gear inspections to determine the adequacy of current maintenance practices and report the findings. (Class II, Priority Action) Status: Open - Unacceptable Action

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